almost to 2000 metres, to the east of the Hardangerfjord. On the underlying granite rests a phyllite series, containing at the base black schists with *Dictyonema flabelliforme*, giving the series a place within the Upper Cambrian and Lower Silurian. But above this phyllite, and perhaps concordantly, rest metamorphic schists, beginning with quartzite beneath and ending in a coarse, typical gneiss. Some geologists are inclined to think this inversion due to an immense overthrust. The boundary between the granite and the phyllite is very level, and Mr. Rekstad suggests the surface of the granite to be an Archæan or Cambrian peneplain. The paper is accompanied by a coloured map of the region.

In the last paper Mr. Rekstad shows that the upper limit of the mountain forests has of late subsided 300 to 400 metres in southern Norway, pointing to a decrease in temperature of 2·1° to 2·4° C. In the time of mild climate glaciers must have been almost absent. He places this time to the age of the *tapes*-banks, when the land had performed about four-fifths of its total upheaval since the close of the Glacial period.

The papers are all illustrated by photographs and diagrams. They are written in Norwegian, but each is accompanied by a summary in English. A. D.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—At the Encaenia on June 22, the honorary degree of D.Sc. was conferred upon the following:—The Hon. C. A. Parsons, Mr. Marconi, Sir William S. Church, Sir Andrew Noble, Sir William Crookes, Sir David Gill, Sir John Murray, Prof. Alfred Marshall, Prof. J. J. Thomson, Prof. Horace Lamb, Prof. A. R. Forsyth, Prof. J. Dewar, and Prof. J. Larmor.

CAMBRIDGE.—In the natural sciences tripos forty-five men and one woman have gained first classes in part i.; thirteen men and three women have gained first classes in part ii.

The Raymond Horton-Smith prize, for the best M.D. thesis of the year, has been awarded to Dr. F. A. Bainbridge, Trinity. Dr. B. N. Tebbs, Queens', receives honourable mention.

The Harkness studentship in geology has been awarded to Mr. O. T. Jones, Trinity.

Dr. H. B. Roderick, Emmanuel, has been appointed demonstrator of surgery.

The Frank Smart studentship of 100*l.* a year for research in botany will be filled up in July. Applications must be sent to the Vice-Chancellor by July 13.

The degree of doctor of science was conferred on Prof. C. S. Sherrington, F.R.S., at the congregation on June 18.

The Wiltshire prize for geology and mineralogy is divided between H. A. Wootton, Clare, and J. A. Crowther, St. John's.

The Hockin prize for physics at St. John's is also divided, between S. H. Phillips and J. A. Crowther.

The Hutchinson studentship for research in physics is awarded to E. Gold, bracketed third wrangler 1903.

Mr. W. G. Fearnsides (natural sciences tripos, 1900) has been elected a fellow, and Dr. E. H. Griffiths, F.R.S., principal of Cardiff University College, has been elected an honorary fellow, of Sidney Sussex College.

DR. O. ASCHAN has been appointed professor of chemistry at Helsingfors.

THE following honorary degrees were conferred at a convocation of the University of Durham on June 22:—D.C.L., Sir Daniel Morris; D.Sc., Prof. R. A. Sampson, F.R.S.; D.C.L., Dr. Harold F. Wilson; D.Sc., Mr. David Woolacott.

THE first number of the second volume of the *Investigations* of the Departments of Psychology and Education of the University of Colorado has been received. It contains papers by Mr. F. H. Clark on the scope and efficiency of the normal schools of the United States; by Prof. Libby on co-education and the raw material of the school; and by Mr. J. H. Bair on factors in the learning process.

THE programme containing regulations for the registration, conduct, and inspection of classes and examination of candidates in technological subjects, and for the award of teachers' certificates in manual training and domestic economy, for the session 1904–5, in connection with the City and Guilds of London Institute, has now been published. The programme may be obtained from Mr. John Murray, price ninepence net.

WE have received from Messrs. Swan Sonnenschein and Co., Ltd., a copy of a useful publication compiled from official records by the editor of the "Schoolmaster's Yearbook and Directory." The title and subtitle serve to indicate satisfactorily the scope of the new volume, which is called a "Register of Teachers for Secondary Schools," being the list of teachers registered in column B of the Teachers' Register, formed and kept by the Teachers' Registration Council, in accordance with the Order in Council, March 6, 1902, and amending orders. Particulars of address, date of registration, qualifications, experience, recorded in the register for each teacher, are also given. The volume costs two shillings net.

A PAPER read last July at the meeting of the National Educational Association at Boston, Mass., U.S.A., by Prof. W. N. Rice, on the proper scope of geological teaching in the high school and academy, has been reprinted in separate form from the *Proceedings* of the National Educational Association. From a copy of the reprint which has reached us, we learn that Prof. Rice believes "that there should be a required course in physical geography in the first year of the high-school curriculum." The geographical course would by this plan precede the bifurcation of the curriculum necessitated by the fact that in most cases the classical students must begin Greek in the second year. Prof. Rice also considers that a course in geology, which should be chiefly dynamical and structural geology, is a most desirable elective in the fourth year of the curriculum.

THE University College of North Wales has organised a department of forestry or sylviculture in connection with its agricultural department. The desirability of providing facilities for the teaching of forestry in North Wales was brought prominently forward by Lord Onslow some months ago in his address at the opening of the College Farm at the commencement of the present session, and it is gratifying to find that the proposed scheme has so soon been realised. Mr. Fraser Storey has been appointed lecturer in forestry. Not only will the Bangor School of Forestry be the first institution of its kind organised in connection with a university college in this country, but a further innovation has been made in extending the work of the department beyond the limits of ordinary class-teaching. A considerable portion of Mr. Storey's duties will consist in acting as an expert adviser in connection with the principal estates in the district, on which the development of forestry is desirable.

THE Earl of Onslow on Friday last, June 24, opened the gardens of the horticultural department of University College, Reading, in his official capacity as President of the Board of Agriculture. It may be pointed out that for some years Mr. Frederick Keeble has given instruction in the principles of horticulture, but only comparatively recently is it that, owing to the kindness of Mr. Alfred Palmer in putting seven acres of land, conveniently placed, at the disposal of the college, justice has been done to the practical side of the work. At the ceremony to which we have referred, the principal, Mr. W. M. Childs, answered the question as to why horticulture is necessary, and gave three reasons:—(1) the enormous increase in scientific knowledge as to the growing of plants; (2) foreign competition; and (3) the training of teachers in connection with rural education. Lord Onslow, in a brief speech, emphasised the remarks of the principal; he dwelt particularly on the third point, and alluded to the need for properly presenting produce to the purchaser. Mr. Martin J. Sutton afterwards said that never before had he attended a meeting at which the teaching of horticulture had received the official recognition of the Government. Seeing the hard struggle which has been made to introduce such teaching of horticulture as gives proper attention to the scientific side the results which we chronicle are most satisfactory.

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THE academic address to the University College of North Wales was delivered on Friday last by Sir Arthur Rücker, F.R.S., principal of the University of London, who chose as his subject "University Organisation in Great Britain." Sir Arthur Rücker traced the various phases through which the university systems of our country had passed, starting with the residential university, represented at the present time by Oxford and Cambridge (and in former days by Stamford). Next in order of development came the purely examining University of London, which led to the formation of provincial university colleges. The federal university came next in the Victoria University and University of Wales. The University of Birmingham represented a new phase, namely, the municipal university, of which at the present time there were two representatives in Lancashire and two in Yorkshire. The impossibility of raising by private subscriptions sufficient funds for the endowment of universities and university colleges resulted in the necessity of Government subsidies, and a great deal more ought to be expected in this direction in the near future. In the further development of university organisation a number of interesting questions would have to be answered. These related to such points as how far Government assistance was to be given to colleges and how far to universities, whether institutions partaking of the character both of colleges and universities should be subsidised under both headings, whether it was desirable to confer on new universities generally the powers of examining external students as provided for in the charter of the Birmingham University, and the extent to which universities subsidised at the same time by municipalities and the Government should be under the inspection of both bodies.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 2.—"Colours in Metal Glasses and in Metallic Films." By J. C. Maxwell **Garnett.**

The first part of the paper is devoted to coloured glasses. The phenomena which it seeks to explain were observed by Siedentopf and Zsigmondy.

It is proved in this paper that every medium made up of metal spheres embedded in a non-absorbing substance in such manner that the average distance between two adjacent spheres is much less than a wave-length of light has a perfectly definite colour, depending only on the optical constants of the metal of which the spheres are made, on the refractive index of the substance in which they are embedded, and on the quantity of metal present, but not on the size or distance apart of the spheres.

It is shown that the particles which Siedentopf and Zsigmondy observed in gold glasses are spherical when their diameters are less than 10^{-5} cm. The presence of the metal spheres accounts for the red colour of gold and copper ruby glass, and for the yellow colour of silver glass, and would give a blue-violet colour to "potassium-sodium" glass (potassium-sodium being an amalgam of which the optical constants have been determined by Drude).

Experiments are described proving that these characteristic colours can be produced in a colourless metal glass containing the metal in solution or in combination (the state in the manufacture of gold or copper ruby glass before the second heating) by the β radiation from radium.

The calculated properties of media containing many metal spheres to a wave-length of light account for the changes of colour, for the initial increase in absorption, and for the final change to almost complete transparency which Mr. G. T. Beilby observed during the annealing of gold and silver films. Explanations are given of the changes of colour on heating observed by Prof. R. W. Wood in potassium and sodium films deposited on the insides of exhausted glass bulbs. The increase in strength of colour which was generally observed in the light transmitted by these films when the plane of polarisation of obliquely incident light was changed from that of incidence to a perpendicular position is also explained.

Evidence is adduced to show that the allotropic silvers obtained by Carey Lea are further examples of this type of medium.

"A Method of Measuring directly High Osmotic Pressures." By the Earl of **Berkeley** and E. G. J. **Hartley.** Communicated by W. C. D. Whetham, F.R.S.

This is a preliminary paper describing the authors' method of determining high osmotic pressures. It is as follows:—

A porous porcelain cylinder, glazed only at the ends, has a copper ferrocyanide membrane deposited on its outer surface. The solution surrounds the cylinder, and the inside, which is connected to a graduated glass capillary, is filled with water. By means of a plunger, which works in a steel cylinder and is actuated by a lever and weights, pressure is put upon the solution. So long as this pressure is less than the osmotic pressure of the solution, water from the inside of the cylinder passes through the membrane into the solution, and consequently the water-level in the capillary falls. When the pressure on the solution is gradually increased, the rate at which the level falls gradually decreases, and this continues until the osmotic pressure of the solution is reached; then the level in the capillary is stationary. A further increase of pressure on the solution will then cause the level to rise. The rate of movement of the level in the capillary is a function of the difference between the osmotic pressure and the pressure on the solution, so that by observing the changes in this rate consequent on the corresponding changes in the pressure, the point at which the latter is equal to the osmotic pressure can be deduced. The results of some experiments with cane sugar, extending up to a solution having an osmotic pressure of 45 atmospheres, are given.

The semipermeable membranes are made partly by following Pfeffer and partly by a modification of Morse's electrolytic method. By this means a membrane that withstood 120 atmospheres pressure was obtained.

"On the Electric Effect of Rotating a Dielectric in a Magnetic Field." By Dr. Harold A. **Wilson.** Communicated by Prof. J. J. Thomson, F.R.S.

It was shown by Faraday in 1831 that an electromotive force is induced in a conductor when it moves in a magnetic field so as to cut the lines of force. The object of the experiments described in this paper was to see if a similar electromotive force is induced in a dielectric when it moves in a magnetic field.

According to Maxwell's electromagnetic theory as developed by H. A. Lorentz and Larmor, such an electromotive force should be induced in a dielectric, and should be equal to that in a conductor multiplied by the factor $1-K^{-1}$, where K is the specific inductive capacity of the dielectric.

The method employed was to rotate a hollow cylinder of ebonite in a magnetic field parallel to the axis of the cylinder. The inside and outside surfaces of the cylinder were provided with metal coatings, with which electrical contact was made by sliding brushes. The inside coating was connected to earth, and the outside coating to one pair of the quadrants of a sensitive quadrant electrometer, the other pair of quadrants being connected to earth. The magnetic field was then reversed, so reversing the induced electromotive force in the ebonite. The resulting electric displacement was measured by means of the electrometer, the quantity of electricity required to produce a given deflection of the electrometer needle being determined by means of a small parallel plate guard ring condenser.

The cylinder used was 10 cm. long and $2r_2=4\cdot15$ cm., $2r_1=2\cdot01$ cm. It was mounted in a solenoid having 95 turns per cm., by which a magnetic field of strength 1500 could be produced. The cylinder was driven by a ½ horse-power motor, and could be run at 200 revolutions per second.

The mean result obtained for the quantity of electricity set free on the outside coating of the cylinder, on reversing the magnetic field, only differs from the amount calculated theoretically by 1 per cent. The specific inductive capacity of the ebonite, as determined by measuring the capacity of the cylinder, was 3·54, while the value calculated from the results obtained was 3·64.

The results obtained are thus in complete agreement with the theories of Lorentz and Larmor, and may be regarded as a confirmation of these theories.

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